Data Communications and Networks

ITS323: Introduction to Data Communications

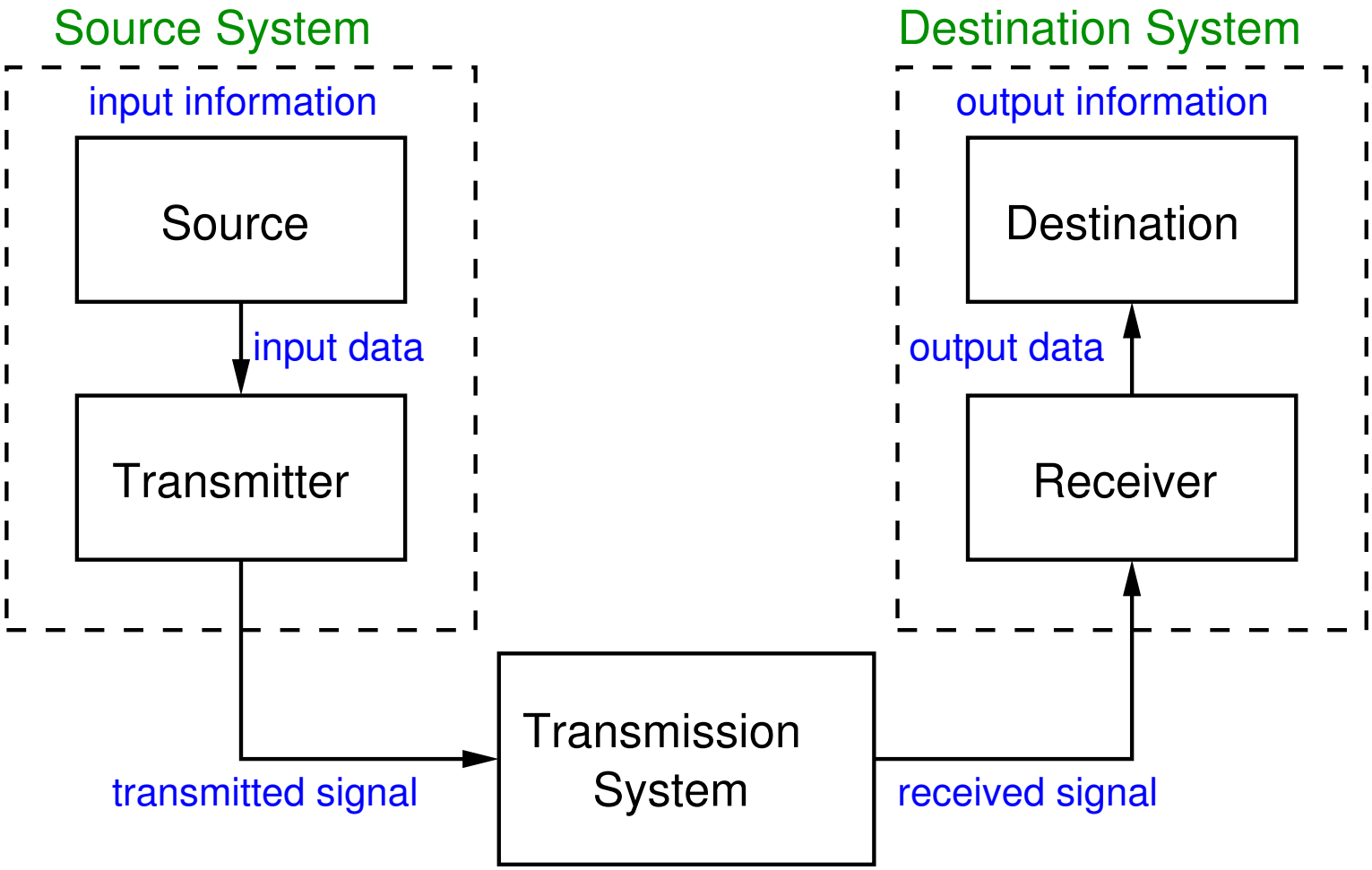
Sirindhorn International Institute of Technology
Thammasat University

Prepared by Steven Gordon on 4 August 2014
ITS323Y14S1L01, Steve/Courses/2014/s1/its323/lectures/datacomms.tex, r3261

What Is Data Communications?

- When we communicate we are sharing information
  - Local sharing, e.g. face-to-face
  - Remote sharing, e.g. over some distance
- Data: information being shared, e.g. text, numbers, images, audio, video
- Data Communications: exchange of data between two (or more) devices via some transmission medium

A Model of Communication Systems



A Model of Communication Systems

Aim: transfer information from source to destination

Source: Device that generates data to be transmitted

Transmitter: Converts data from source into transmittable signals

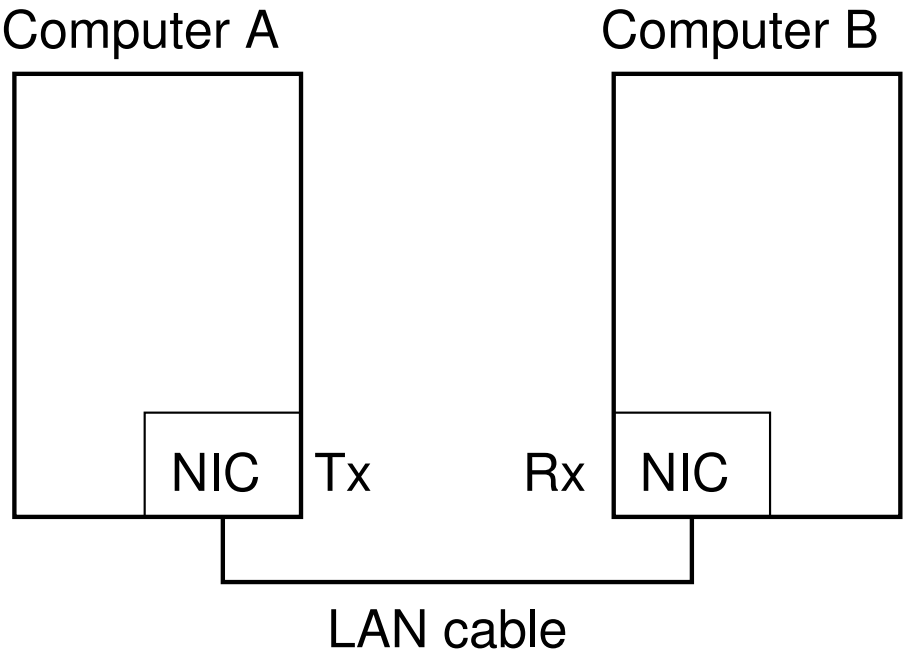
Transmission system: Carries data from source to destination

- Maybe simple as a single link/cable
- Or a complex network, e.g. the Internet

Receiver: Converts received signal into data

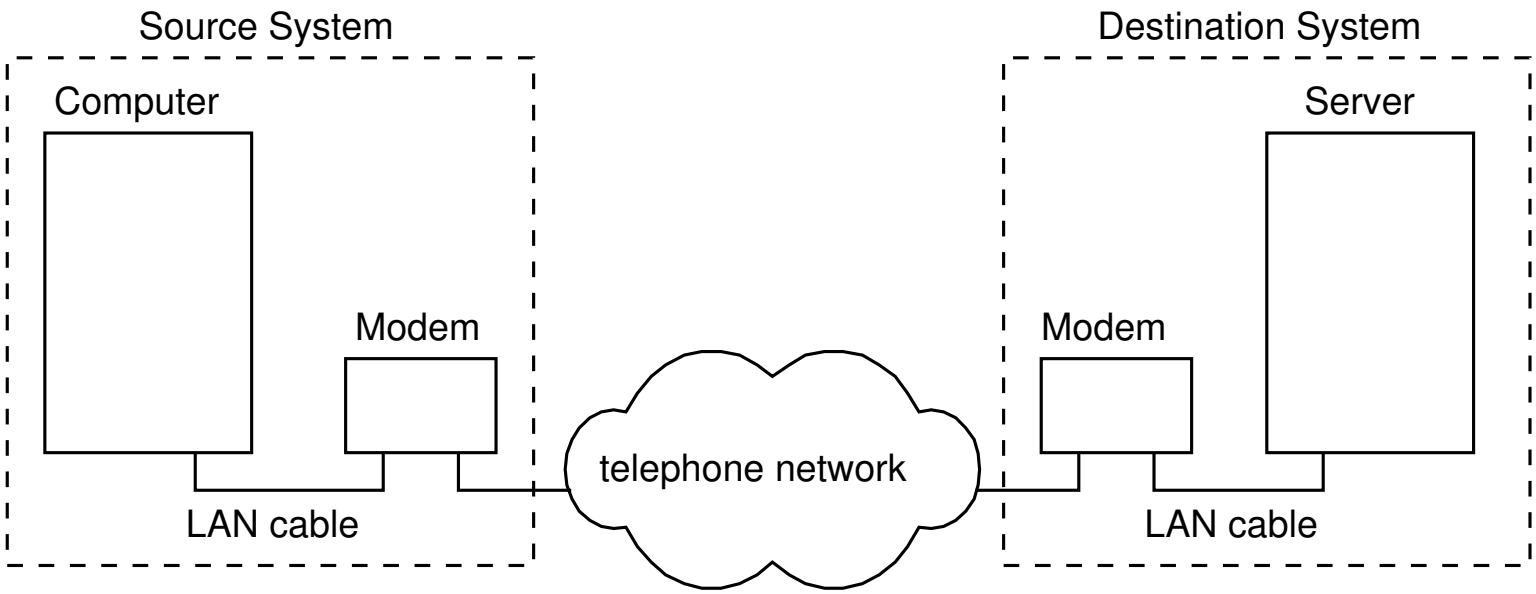
Destination: Takes and uses incoming data

Example: Computer to Computer



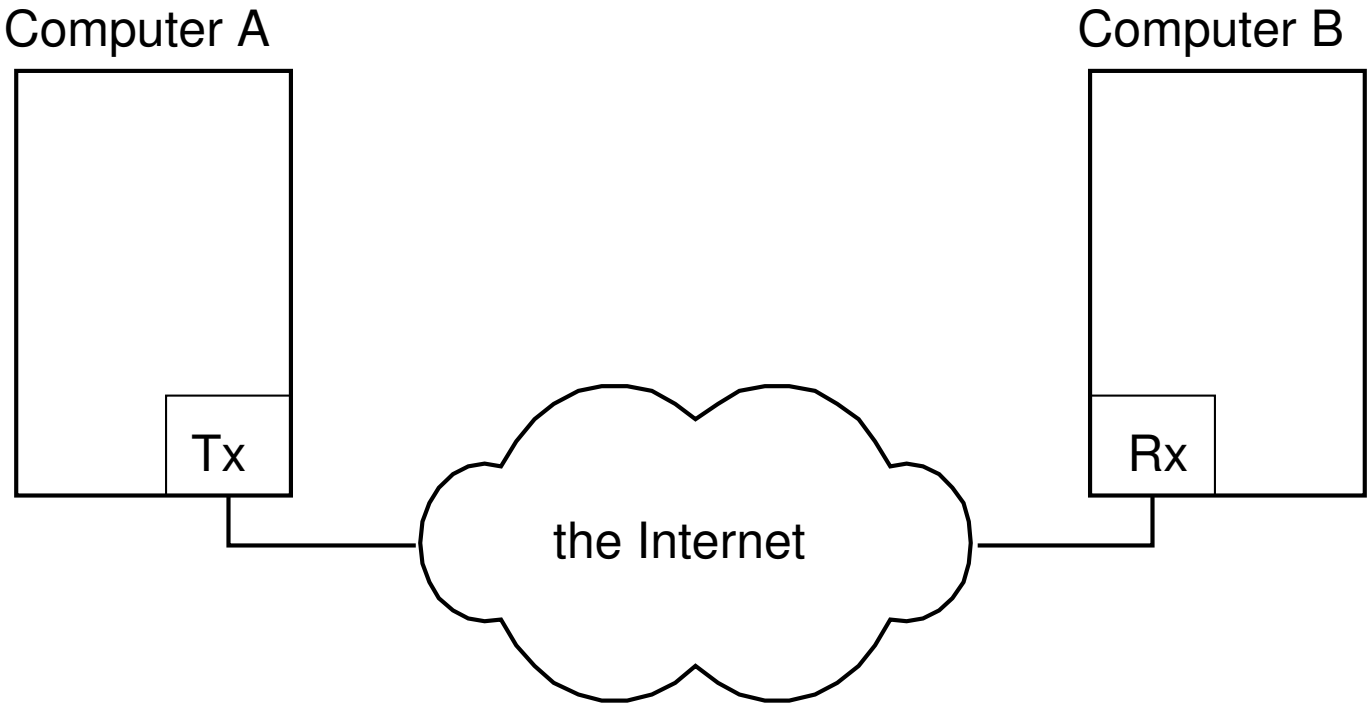
- Transmitter (Tx) is built into source computer (Network Interface Card)
- Recevier (Rx) is built into destination computer
- Transmission system is single link between two computers

Example: Old Dialup Connection



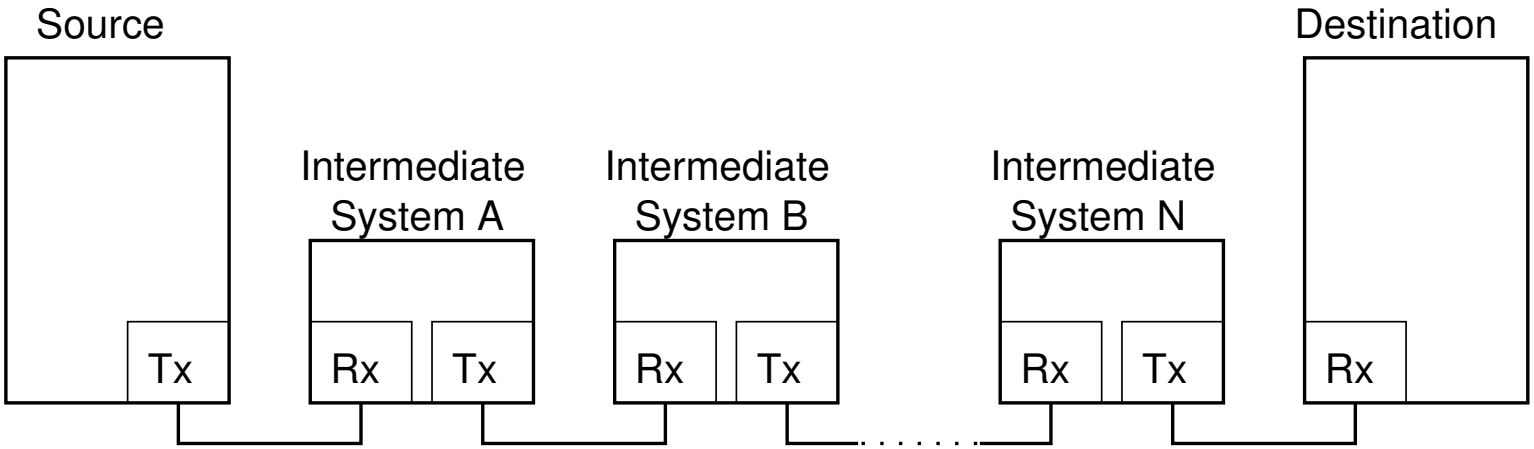
- Source and transmitter are separate devices (similar at destination)
- Transmission system is telephone network

Example: Communications via the Internet



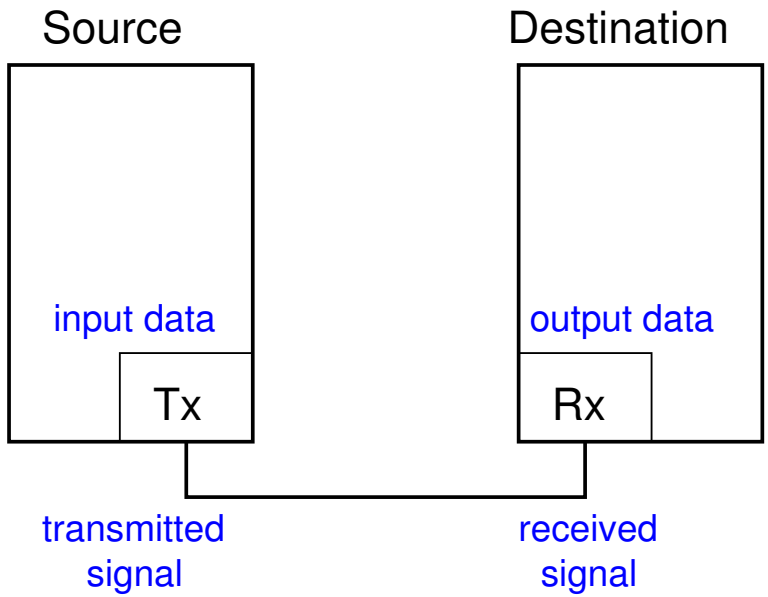
- Source and transmitter may support different technologies
- Transmission system is the Internet

General Model for Communications via a Network



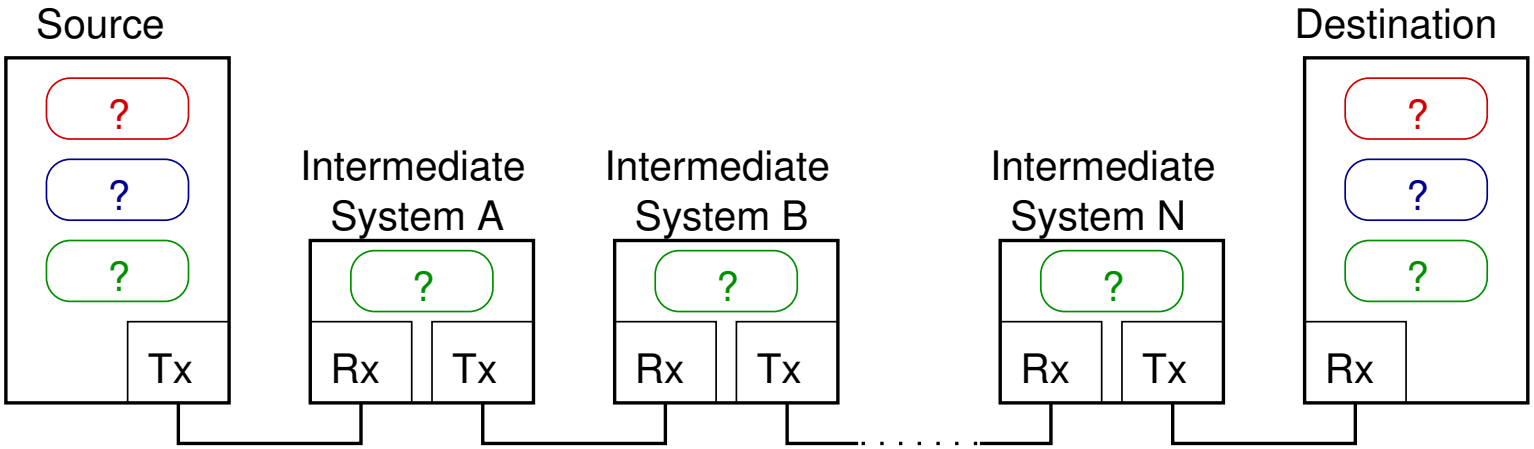
- Source system generates data
- Intermediate systems receive signal from previous system and then transmit to next system
- Destination system receives and processes the data
- Source and destination are connected via multiple transmission systems (or links) to form a network

Challenges with Link Communications



- How to convert information into transmittable signals?
- What are the characteristics of signals?
- What transmission media to use?
- How to efficiently encode data as signals?
- How to deal with errors?
- How to share media amongst two or more transmitters?

Challenges with Networked Communications



- How do intermediate systems receive/send data?
- How to select which intermediate systems to send via?
- What happens if failures within intermediate systems?
- How to create applications without knowing the details of underlying network and technologies?

Some Concepts

- Data is communicated across links by sending signals
- Digital data is often into divided smaller, manageable chunks called packets (or messages, datagrams, frames)
  - Often extra information called a header (or trailer) is added to the data to support the data transfer
- There are many tasks in communication systems; tasks are grouped into layers, e.g.
  - Tasks for sending signals across a link are part of *physical* layer
  - Tasks for delivering data across multiple links are part of *network* layer
- The rules that devices follow for communicating are called protocols
- To identify which device data should be sent to, addresses are used
- Standards define protocols that organisations, companies and/or governments have agreed to use